

# M Series Manual Handwheel Gear Actuator

## Contents

Introduction .....	1
Scope of Manual .....	1
Description .....	1
Specifications .....	1
Installation .....	2
Operation .....	4
Maintenance .....	4
Lubrication .....	5
Parts Ordering .....	5

## Introduction

### Scope of Manual

This instruction manual includes installation, operation, maintenance, and parts ordering information for M Series manual handwheel gear actuators. Refer to separate manuals for instructions covering the valves used with these actuators.

Do not install, operate, or maintain an M Series handwheel gear actuator without first • being fully trained and qualified in valve, actuator, and accessory installation, operation, and maintenance, and • carefully reading and understanding the contents of this manual. If you have any questions about these instructions, contact your Emerson Process Management™ sales office before proceeding.

### Description

M Series handwheel gear actuators (figure 1) are totally enclosed, weatherproof, worm gear actuators for reliable manual operation with Type A11, A31A and A41 High Performance Butterfly Valves. The M actuator consists of a body housing, cover, worm gear, input shaft, and handwheel. The housing is grease packed.



W4715-1 / IL

*Figure 1. M Series Handwheel Gear Actuator*

### Specifications

Specifications for the M Series manual handwheel gear actuators are shown in table 1.

#### Note

**Neither Emerson, Emerson Process Management, nor any of their affiliated entities assumes responsibility for the selection, use and maintenance of any product. Responsibility for the selection, use, and maintenance of any product remains with the purchaser and end-user.**



# M Series Actuator

Table 1. Specifications

Actuator Sizes	Construction Materials
See tables 2, 3 and 4	<b>Housing and Cover:</b> Cast iron <b>Worm:</b> Steel
<b>Valve Compatibility</b>	<b>Worm Gear:</b> Manganese Bronze
<ul style="list-style-type: none"> <li data-bbox="169 509 764 636">■ Accepts Type A11 valve square-end shafts from 10.3 to 34.9 mm (13/32 to 1-3/8 inches), keyed shafts from 38.1 to 44.5 mm (1-1/2 to 1-3/4 inches)<sup>(1)</sup></li> <li data-bbox="169 657 731 720">■ Accepts Type A31A valve keyed shafts from 44.5 to 57.2 mm (1-3/4 to 2-1/4 inches)</li> <li data-bbox="169 742 752 805">■ Accepts Type A41 valve Double D shafts from 12.7 to 44.5 mm (1/2 to 1-3/4 inches)</li> </ul>	<b>Input Shaft:</b> Steel (303 SST on request) <b>Handwheel:</b> Cast Iron
<b>Maximum Torque Output</b>	<b>Mounting Positions</b>
See Bulletin 22.2:M	See figure 2
<b>Handwheel Rotation</b>	<b>Dimensions and Approximate Weights</b>
Clockwise handwheel rotation closes the valve (produces clockwise rotation of the valve shaft)	See Bulletin 22.2:M

1. As an option, CL600 NPS 10 (with 1-1/2 inch keyed shaft) and NPS 12 (with 1-3/4 inch shaft) Type A11 valves require a keyed connection if being used with size 9KE or 10KE-6 actuators.

## Installation



### WARNING

To avoid personal injury or property damage resulting from the sudden release of pressure, do not install the actuator where service conditions could exceed the limits given in this manual or on the appropriate nameplates. Use pressure-relieving devices as required by government or accepted industry codes and good engineering practices.

Always wear protective gloves, clothing, and eyewear when performing any installation operations to avoid personal injury.

Check with your process or safety engineer for any additional measures

that must be taken to protect against process media.

If installing into an existing application, also refer to the WARNING at the beginning of the Maintenance section in this instruction manual.

The M Series gear actuator is normally mounted on a valve at the factory. However, the actuator can be field mounted; it can be mounted in any position on the Type A11 or A31A and it can be mounted in positions 1 and 3 on the Type A41, as shown in figure 2. Make clearance considerations before mounting the actuator to determine the most suitable mounting position.

The M Series actuator has a direct stab-on design. Simply insert the valve shaft into the broached area of the body housing. Then attach the mounting bracket to the actuator, using the torques listed in table 5, and attach the mounting bracket to the valve.

# Instruction Manual

Form 5454

November 2007

# M Series Actuator

Table 2. M Series Gear Actuator for A11 (CL600)

VALVE SIZE, NPS	VALVE SHAFT SIZE, INCHES	MAXIMUM RECOMMENDED TORQUE <sup>(1)</sup>		ACTUATOR SIZE	HANDWHEEL DIAMETER, INCHES	RIM FORCE <sup>(2)</sup>		NUMBER OF TURNS TO CLOSE <sup>(3)</sup>	MAXIMUM TORQUE RATING OF ACTUATOR	
		N·m	lb·in			n	lb		N·m	Lbf·in
3	13/32	113	1,000 <sup>(4)</sup>	1KE	12	80	18	9.5	452	4,000
4	5/8	303	2,690 <sup>(4)</sup>	1KE	12	209	47	9.5	452	4,000
6	7/8	643 765	5,700 6,780 <sup>(4)</sup>	2KE 5KE	12	445 400	100 90	9.5 12.5	678 904	6,000 8,000
8	1	643 846 1349	5,700 7,500 11,960 <sup>(4)</sup>	2KE 5KE 7KE	12	445 445 436	100 100 98	9.5 12.5 13.5	678 904 2,260	6,000 8,000 20,000
10	1-3/8 1-1/2 1-1/2	1354 2144 3520	12,000 19,000 31,160 <sup>(4)</sup>	7KE 9KE 10KE-6	18	440 440 214	99 99 48	13.5 16 72	2,260 3,390 8,474	20,000 30,000 75,000
12	1-3/8 1-3/4 1-3/4	1354 2144 3520	12,000 19,000 31,160 <sup>(4)</sup>	7KE 9KE 10KE-6	18	440 440 214	99 99 48	13.5 16 72	2,260 3,390 8,474	20,000 30,000 75,000

1. Maximum recommended torque for the valve/actuator combination is based on valve shaft rating, actuator rating and rim force.

2. Rim force required to produce Maximum recommended torque.

3. This column shows the number of times the handwheel must be turned to close the valve 90 degrees.

4. Shaft rating of the A11 valve.

Table 3. M Series Gear Actuator for A31A

VALVE SIZE, NPS	VALVE SHAFT SIZE, INCHES	MAXIMUM RECOMMENDED TORQUE <sup>(1)</sup>		ACTUATOR SIZE	HANDWHEEL DIAMETER, INCHES	RIM FORCE <sup>(2)</sup>		NUMBER OF TURNS TO CLOSE <sup>(3)</sup>	MAXIMUM TORQUE RATING OF ACTUATOR	
		N·m	lb·in			n	lb		N·m	Lbf·in
<b>CL150</b>										
14	1-3/16	644 847 1287	5,700 7,500 11,390 <sup>(4)</sup>	2KE 5KE 7KE	12 12 18	445 445 418	100 100 94	9.5 12.5 13.5	271 904 2,260	6,000 8,000 20,000
16	1-1/4	644 847 1,579	5,700 7,500 13,970 <sup>(4)</sup>	2KE 5KE 7KE	12 12 18	445 445 512	100 100 115	9.5 12.5 13.5	271 904 2,260	6,000 8,000 20,000
18	1-1/2	1356 2188 2188	12,000 19,370 <sup>(4)</sup> 19,370	7KE 9KE 10KE-6	18 24 18	440 449 133	99 101 30	13.5 16 72	2,260 3,390 8,474	20,000 30,000 75,000
20	1-3/4	1356 2147 2555	12,000 19,000 22,620 <sup>(4)</sup>	7KE 9KE 10KE-6	18 24 18	440 440 156	99 99 35	13.5 16 72	2,260 3,390 8,474	20,000 30,000 75,000
24	2-1/4	2147 8,474	19,000 75,000	9KE 10KE-6	24 18	440 516	99 116	16 72	3,390 8,474	30,000 75,000
<b>CL300</b>										
14	1-3/4	1356 2555	12,000 22,620 <sup>(4)</sup>	7KE 9KE	18 24	440 525	99 118	13.5 16	2,260 3,390	20,000 30,000
16	1-3/4	1356 2555	12,000 22,620 <sup>(4)</sup>	7KE 9KE	18 24	440 525	99 118	13.5 16	2,260 3,390	20,000 30,000
18	2-1/4	2147 6,985	19,000 61,830 <sup>(4)</sup>	9KE 10KE-6	24 18	440 423	99 95	16 72	3,390 8,474	30,000 75,000
20	2-3/4	2147 8474	19,000 75,000	9KE 10KE-6	24 18	440 516	99 116	16 72	3,390 8,474	30,000 75,000
24	2-3/4	8474	75,000	10KE-6	18	516	116	72	8,474	75,000

1. Maximum recommended torque for the valve/actuator combination is based on valve shaft rating, actuator rating and rim force.

2. Rim force required to produce Maximum recommended torque.

3. This column shows the number of times the handwheel must be turned to close the valve 90 degrees.

4. Shaft rating of the A31A valve.

# M Series Actuator

Table 4. M Series Gear Actuator for A41

VALVE SHAFT SIZE, INCHES	ACTUATOR SIZE	SHAFT RATING		HANDWHEEL DIAMETER, INCHES	RIM FORCE <sup>(1)</sup>		NUMBER OF TURNS TO CLOSE <sup>(2)</sup>	MAXIMUM TORQUE RATING OF ACTUATOR	
		N•m	lb•in		n	lb		N•m	Lbf•in
1/2	0KE/D1	58	515	8	441	21			
5/8	0KE/D2	138	1,230	8	227	51	6	271	2,400
3/4	0KE/D3	240	2,120	8	391	88			
1	2KE/D4	468	4,140	12	325	73	9.5	678	6,000
1-1/4	6KE/D5	1,110	9,820	24	365	82			
1-1/2	6KE/D6	1,356	12,000	24	445	100	10	1,356	12,000
1-3/4	9KE/D7	2,658	23,520	36	365	82	16	3,390	30,000

1. Rim force required to produce shaft rating torque.

2. This column shows the number of times the handwheel must be turned to close the valve 90 degrees.

Table 5. M Series Mounting Plate to Gearbox

Type M Actuator	Bolt Size	Bolt Torque N•m	Bolt Torque Lbf•f
<b>A11 and A31A Compatible</b>			
1KE	1/2	91	67
2KE	1/2	91	67
5KE	1/2	91	67
7KE	5/8	163	120
9KE	5/8	163	120
10KE-6	5/8	163	120
<b>A41 Compatible</b>			
0KE/D1	5/16	22	16.5
0KE/D2	5/16	22	16.5
0KE/D3	5/16	22	16.5
2KE/D4	3/8	39	29
6KE/D5	3/8	39	29
6KE/D6	5/8	163	120
9KE/D7	3/4	258	190

## Operation

After the actuator and control valve assembly are installed, the manual actuator is ready for operation.

### CAUTION

Applying too much torque to the actuator and valve parts could cause damage to the parts. To avoid such damage, do not exceed the rim force listed in table 2, 3 and 4 or any other torque limitation of internal valve parts. Also, do not use wrenches or other devices on the handwheel or handwheel shaft to increase operating force.

## Maintenance

### WARNING

Avoid personal injury from sudden release of process pressure. Before performing any maintenance operations:

- Always wear protective gloves, clothing, and eyewear when performing any maintenance operations to avoid personal injury.
- Disconnect any operating lines providing air pressure, electric power, or a control signal to the actuator. Be sure the actuator cannot suddenly open or close the valve.
- Use bypass valves or completely shut off the process to isolate the

## Instruction Manual

Form 5454

November 2007

## M Series Actuator

**valve from process pressure. Relieve process pressure on both sides of the valve. Drain the process media from both sides of the valve.**

- Vent the power actuator loading pressure and relieve any actuator spring precompression.
- Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.
- The valve packing box may contain process fluids that are pressurized, even when the valve has been removed from the pipeline. Process fluids may spray out under pressure when removing the packing hardware or packing rings, or when loosening the packing box pipe plug.
- Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

If the rim force required to rotate the handwheel exceeds the rim force listed in table 2, 3, or 4, check for the following conditions:

- Insufficient lubrication
- Seized actuator parts
- Excessive pressure drop across the valve
- Obstruction to the valve disc rotation

If the manual actuator does not seem to control the process fluid, the worm or drive sleeve gear teeth may be broken, the handwheel pin may be sheared, or the valve parts may be broken. Purchase a replacement manual actuator if necessary. Refer to the valve instruction manual if valve maintenance is needed.

## Lubrication

The interior parts of the M Series actuator should be lubricated on a regular schedule with a quality gear lubricant. The interior parts should also be lubricated whenever difficulty in handwheel rotation indicates a need for lubrication.

1. Isolate the control valve from the line pressure, release pressure from both sides of the valve body, and drain the process media from both sides of the valve.
2. Remove the cap screws that secure the gearbox cover plate and remove the gearbox cover plate.
3. Coat the worm, the drive sleeve gear teeth, and the bearing surfaces of the gearbox housing and worm with a quality gear lubricant.
4. Replace the cover plate and cap screws using the bolt torques listed in table 5.
5. Replace the manual actuator on the valve. Adjust the actuator travel stop to limit the open and closed positions of the valve disc following the steps in the appropriate valve instruction manual.

## Parts Ordering

When corresponding with your Emerson Process Management sales office, indicate the size of the M Series actuator. The size is stamped on the gearbox. You should also provide the serial number of the valve.

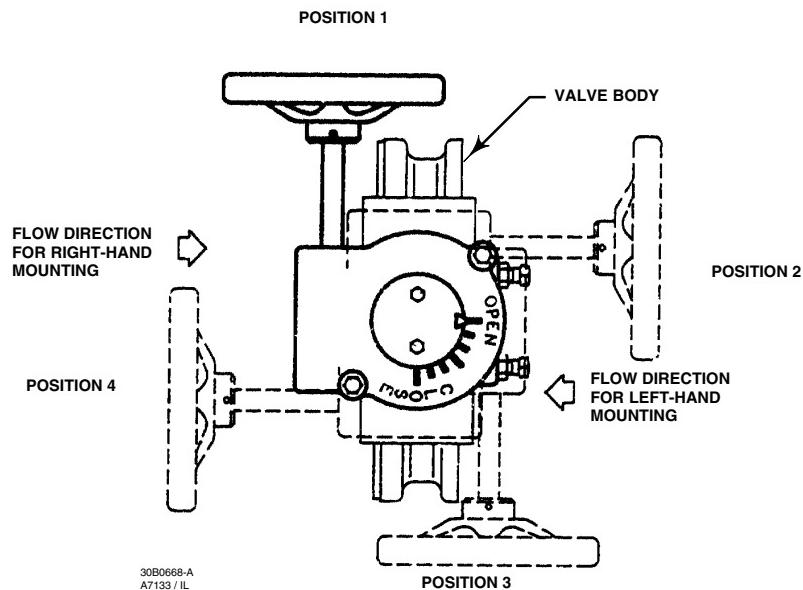


### WARNING

**Use only genuine Fisher® replacement parts. Components that are not supplied by Emerson Process Management should not, under any circumstances, be used in any Fisher valve, because they will void your warranty, might adversely affect the performance of the valve, and could give rise to personal injury and property damage.**

### Note

**Neither Emerson, Emerson Process Management, nor any of their affiliated entities assumes responsibility for the selection, use and maintenance of any product. Responsibility for the selection, use, and maintenance of any product remains with the purchaser and end-user.**



**NOTE:**  
ONLY POSITIONS 1 AND 3 ARE APPLICABLE TO TYPE A41.

*Figure 2. Available Mounting Positions*

# Instruction Manual

Form 5454

November 2007

# M Series Actuator

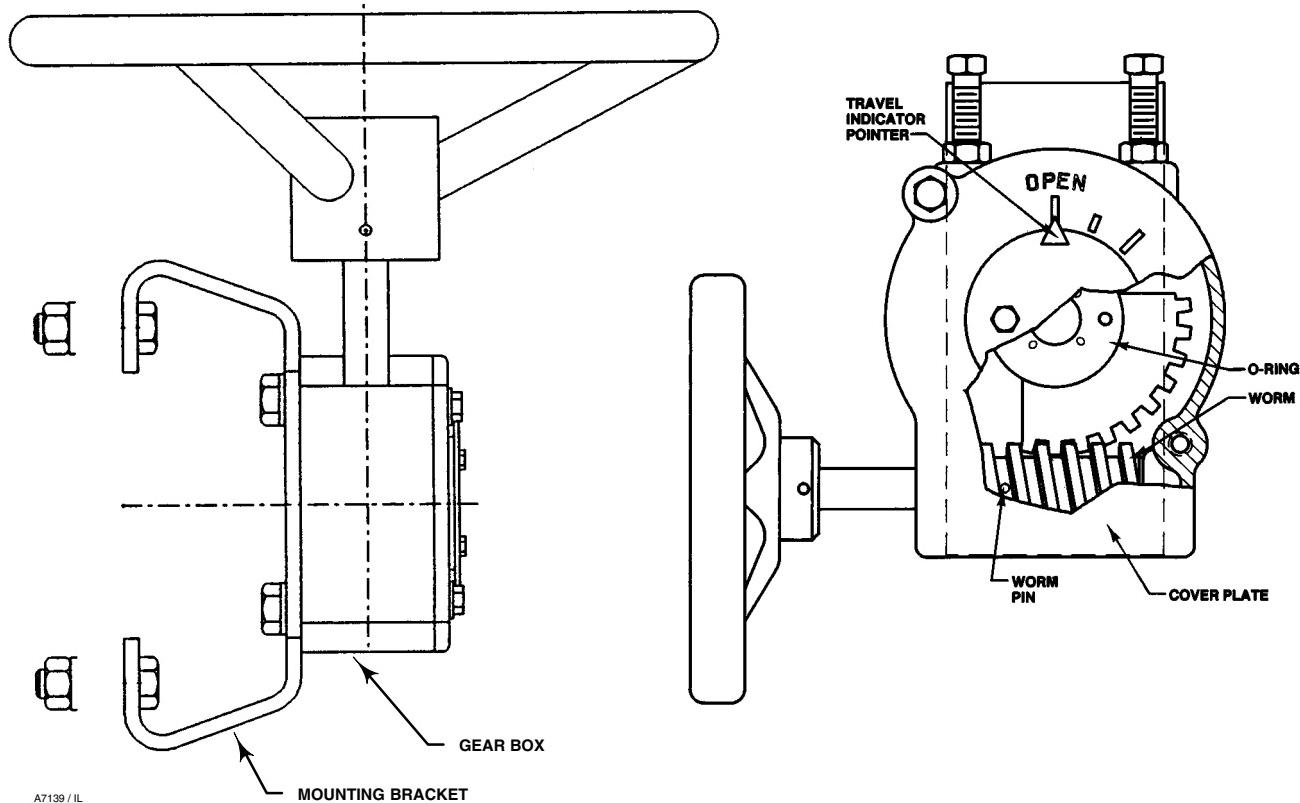


Figure 3. Typical M Series Assembly

Fisher is a mark owned by Fisher Controls International LLC, a member of the Emerson Process Management business division of Emerson Electric Co. Emerson Process Management, Emerson, and the Emerson logo are trademarks and service marks of Emerson Electric Co. All other marks are the property of their respective owners.

*The contents of this publication are presented for informational purposes only, and while every effort has been made to ensure their accuracy, they are not to be construed as warranties or guarantees, express or implied, regarding the products or services described herein or their use or applicability. We reserve the right to modify or improve the designs or specifications of such products at any time without notice.*

Neither Emerson, Emerson Process Management, nor any of their affiliated entities assumes responsibility for the selection, use and maintenance of any product. Responsibility for the selection, use and maintenance of any product remains with the purchaser and end-user.

**Emerson Process Management**

Marshalltown, Iowa 50158 USA

Cernay 68700 France

Sao Paulo 05424 Brazil

Singapore 128461

[www.Fisher.com](http://www.Fisher.com)